

1 1-69. (Cancelled)

1 70. (New) A spectral processing method for compensating a plurality of  
2 sequential spectra and profiles derived therefrom for effects of drift of data along an  
3 independent variable axis, comprising:

4 transforming a plurality of sequential spectra obtained from a spectrometer to provide  
5 an array of row vectors compensated for effects of drift of data along an independent variable  
6 axis, wherein the array of row vectors compensated for effects of drift of data along the  
7 independent variable axis constitutes a drift-compensated array;

8 performing a principal-factor determination on the drift-compensated array to provide  
9 a set of principal factors compensated for effects of drift of data along the independent  
10 variable axis; and

11 generating, from a profile trajectory of the row vectors compensated for effects of  
12 drift of data along the independent variable axis lying within a space of principal factors  
13 compensated for effects of drift of data along the independent variable axis, scaled target-  
14 factor profiles compensated for effects of drift of data along the independent variable axis.

1 71. (New) The spectral processing method of claim 70, wherein the independent  
2 variable axis comprises an abscissa of the electron spectrum.

1 72. (New) The spectral processing method of claim 71, wherein the drift  
2 comprises drift of data along the independent variable axis in a positive or negative direction.

1 73. (New) The spectral processing method of claim 70, wherein the independent  
2 variable axis comprises a axis representing temporal displacement of the data.

1 74. (New) The spectral processing method of claim 70 further comprising  
2 outputting the transformed array of row vectors compensated for drift of data along the  
3 independent variable axis as a sequential series of moduli wherein phase factors due to drift  
4 are nullified.

1        75. (New) The spectral processing method of claim 70 further comprising  
2 generating drift-compensated compositional profiles from the drift-compensated scaled  
3 target-factor profiles.

1        76. (New) The spectral processing method of claim 70, wherein the transforming  
2 the plurality of sequential spectra further comprises:

3            inputting a plurality of sequential spectra from a spectrometer into a computer  
4 system;

5            ordering the spectra in a primal array of row vectors, wherein each sequential  
6 spectrum constitutes a successive row vector of the primal array; and

7            removing phase factors due to drift using a dephasing procedure that transforms the  
8 primal array into a drift-compensated array.

1        77. (New) The spectral processing method of claim 76, wherein the dephasing  
2 procedure for transforming the primal array into the drift-compensated array further  
3 comprises applying a Fourier transform to the spectra in the primal array of row vectors  
4 forming an array of Fourier-transformed row vectors, multiplying each Fourier-transformed  
5 row vector by a complex conjugate of each Fourier-transformed row vector to form a squared  
6 moduli vector thereby removing phase factors due to drift, taking the square root of each  
7 element of the squared moduli vector to create a corresponding moduli vector, and forming a  
8 drift-compensated array of moduli vectors by successively sequencing the moduli vectors as  
9 successive drift-compensated row vectors in a drift-compensated array, wherein the moduli  
10 vectors constitute moduli of Fourier-transformed spectra.

1        78. (New) The spectral processing method of claim 76, wherein the dephasing  
2 procedure for transforming the primal array into the drift-compensated array further  
3 comprises applying a fitting procedure to each spectrum in the primal array using selected  
4 reference spectra, calculating through the fitting procedure a corresponding reference  
5 weighting factor for each reference spectrum corresponding to each spectrum in the primal  
6 array, removing the phase factor due to drift from each spectrum in the primal array by  
7 synthesizing a corresponding drift-compensated spectrum given by the sum of each selected  
8 reference spectrum multiplied by the corresponding reference weighting factor, and forming  
9 a drift-compensated array by successively sequencing the drift-compensated spectra as  
10 successive drift-compensated row vectors in the drift-compensated array.

1        79. (New) The spectral processing method of claim 78 further comprising  
2 outputting analytical results selected from the group consisting of the selected reference  
3 spectra used in the fitting procedure, the drift-compensated row vectors of the drift-  
4 compensated array as a sequential series of drift-compensated spectra, reference weighting  
5 factors for each reference spectrum corresponding to each spectrum in the primal array as a  
6 set of drift-compensated reference-spectrum profiles, and phase factors due to drift for each  
7 reference spectrum corresponding to each spectrum in the primal array as a set of phase-  
8 factor profiles.

1        80. (New) The spectral processing method of claim 70, wherein the performing  
2 the principal-factor determination comprises performing a factor analysis.

1        81. (New) The spectral processing method of claim 80, wherein the performing  
2 the factor analysis further comprises:  
3              forming a covariance array from the drift-compensated array;  
4              applying an eigenanalysis to the covariance array to define a complete set of  
5              eigenvectors and eigenvalues; and  
6              defining a set of drift-compensated principal factors by selecting a subset of  
7              eigenvectors from the complete set of eigenvectors.

1        82. (New) The spectral processing method of claim 81, wherein the defining the  
2        set of drift-compensated principal factors further comprises selecting the drift-compensated  
3        principal factors as a first few eigenvectors corresponding to eigenvalues above a certain  
4        limiting value.

1        83. (New) The spectral processing method of claim 70, wherein the performing  
2        the principal-factor determination comprises performing a linear-least-squares analysis.

1        84. (New) The spectral processing method of claim 83, wherein the performing a  
2        linear-least-squares analysis further comprises:

3            selecting a set of initial factors from the set of drift-compensated row vectors of the  
4        drift-compensated array;

5            performing a linear-least-squares decomposition with the set of initial factors on the  
6        drift-compensated row vectors in the drift-compensated array to provide a set of residue  
7        factors; and

8            performing a Gram-Schmidt orthonormalization on the combined set of initial factors  
9        and residue factors to provide drift-compensated principal factors.

1        85. (New) The spectral processing method of claim 70, wherein the generating  
2        drift-compensated scaled target-factor profiles further comprises:

3            constructing a set of drift-compensated target factors on a space of the drift-  
4        compensated principal factors;

5            applying the set of drift-compensated target factors to a profile trajectory lying within  
6        a space of drift-compensated principal factors to obtain a sequential set of target-factor  
7        weighting factors corresponding to the drift-compensated target factors for the profile  
8        trajectory; and

9            outputting analytical results selected from the group consisting of a set of drift-  
10       compensated scaled target-factor profiles derived from the set of target-factor weighting  
11       factors, and the set of drift-compensated target factors.

1        86. (New) The spectral processing method of claim 85, wherein the constructing  
2 the set of drift-compensated target factors further comprises:

3            generating a profile trajectory on a 3-dimensional projection of a 4-dimensional space  
4 of a set of first-four, drift-compensated principal factors along with a reference tetrahedron  
5 the vertices of which represent each of the first-four, drift-compensated principal factors;

6            enclosing the profile trajectory within an enclosing tetrahedron with vertices centered  
7 on end-points and in proximity to turning points of the profile trajectory, and with faces lying  
8 essentially tangent to portions of the profile trajectory; and

9            calculating the drift-compensated target factors from the normed coordinates of the  
10 vertices of the enclosing tetrahedron in terms of the drift-compensated principal factors.

1        87. (New) The spectral processing method of claim 86, wherein the generating  
2 the profile trajectory further comprises:

3            calculating 4-space coordinates of a profile trajectory of drift-compensated target-  
4 factor profiles on a 4-dimensional space to produce four coordinates for each point in the  
5 profile trajectory, one coordinate for each of the first-four, drift-compensated principal  
6 factors;

7            reducing the dimensionality of the coordinates of the profile trajectory by dividing  
8 each coordinate by a sum of all four 4-space coordinates to produce normed coordinates for  
9 the profile trajectory; and,

10            plotting the normed coordinates for the profile trajectory in a 3-dimensional space the  
11 coordinate axes of which are edges of a reference tetrahedron, the vertices of which  
12 correspond to unit values for each of the first-four, drift-compensated principal factors in a  
13 manner analogous to plotting of coordinates on a quaternary phase diagram.

1        88. (New) The spectral processing method of claim 85, wherein generating drift-  
2 compensated compositional profiles comprises:

3                defining a set of drift-compensated scaled target-factor profile values as the set of  
4 scaled target-factor weighting factors;

5                dividing each drift-compensated scaled target-factor profile value by a profile  
6 sensitivity factor for each constituent corresponding to the target factor to provide a  
7 sensitivity-scaled target-factor profile value;

8                normalizing the sensitivity-scaled target-factor profile value by dividing each  
9 sensitivity-scaled target-factor profile value for a given cycle number by the sum of all the  
10 sensitivity-scaled target-factor profile values for the given cycle number to provide drift-  
11 compensated compositional profile values at the given cycle number; and

12                outputting the drift-compensated compositional profile values as a set of drift-  
13 compensated compositional profiles.

1        89. (New) A waveform processing method for compensating a plurality of  
2 sequential waveforms and profiles derived therefrom for effects of drift comprising:

3                transforming a plurality of sequential waveforms obtained from a waveform-source  
4 device to provide an array of row vectors compensated for effects of drift of data along an  
5 independent variable axis, wherein the array of row vectors compensated for effects of drift  
6 of data along an independent variable axis constitutes a drift-compensated array;

7                performing a principal-factor determination on the drift-compensated array to provide  
8 a set of principal factors compensated for effects of drift of data along an independent  
9 variable axis; and

10                generating, from a profile trajectory of the row vectors lying compensated for effects  
11 of drift of data along the independent variable axis within a space of principal factors  
12 compensated for effects of drift of data along the independent variable axis, scaled target-  
13 factor profiles compensated for effects of drift of data along the independent variable axis.

1        90. (New) The waveform processing method of claim 89, wherein the  
2 independent variable axis comprises a time-axis of a waveform.

1           91. (New) The waveform processing method of claim 90, wherein the drift  
2 comprises a phase lag or lead of data representing a waveform.

1           92. (New) The waveform processing method of claim 89 further comprising  
2 outputting the drift-compensated row vectors of the drift-compensated array as a sequential  
3 series of moduli of Fourier-transformed waveforms.

1           93. (New) The waveform processing method of claim 89, wherein the  
2 transforming the plurality of sequential waveforms further comprises:

3           inputting a plurality of sequential waveforms from a waveform-source device into a  
4 computer system;

5           ordering the waveforms in a primal array of row vectors, wherein each sequential  
6 waveform constitutes a successive row vector of the primal array; and

7           removing phase factors due to drift using a dephasing procedure that transforms the  
8 primal array into a drift-compensated array.

1           94. (New) The waveform processing method of claim 93 wherein the dephasing  
2 procedure for transforming the primal array into the drift-compensated array further  
3 comprises applying a Fourier transform to the waveforms in the primal array of row vectors  
4 forming an array of Fourier-transformed row vectors, multiplying each Fourier-transformed  
5 row vector by a complex conjugate of each Fourier-transformed row vector to form a squared  
6 moduli vector thereby removing phase factors due to drift, taking the square root of each  
7 element of the squared moduli vector to create a corresponding moduli vector, and forming a  
8 drift-compensated array of moduli vectors by successively sequencing the moduli vectors as  
9 successive drift-compensated row vectors in a drift-compensated array, wherein the moduli  
10 vectors constitute moduli of Fourier-transformed waveforms.

1        95. (New) The waveform processing method of claim 93, wherein the dephasing  
2 procedure for transforming the primal array into the drift-compensated array further  
3 comprises applying a fitting procedure to each sequential waveform in the primal array using  
4 selected reference waveforms, calculating through the fitting procedure a corresponding  
5 reference weighting factor for each reference waveform corresponding to each waveform in  
6 the primal array, removing the phase factor due to drift from each waveform in the primal  
7 array by synthesizing a corresponding drift-compensated waveform given by the sum of each  
8 selected reference waveform multiplied by the corresponding reference weighting factor, and  
9 forming a drift-compensated array by successively sequencing the drift-compensated  
10 waveforms as successive drift-compensated row vectors in the drift-compensated array.

1        96. (New) The waveform processing method of claim 95 further comprising  
2 outputting analytical results selected from the group consisting of the selected reference  
3 waveforms used in the fitting procedure, the drift-compensated row vectors of the drift-  
4 compensated array as a sequential series of drift-compensated waveforms, reference  
5 weighting factors for each reference waveform corresponding to each waveform in the primal  
6 array as a set of drift-compensated reference-waveform profiles, and phase factors due to  
7 drift for each reference waveform corresponding to each waveform in the primal array as a  
8 set of phase-factor profiles.

1        97. (New) The waveform processing method of claim 89, wherein the performing  
2 the principal-factor determination comprises performing a factor analysis.

1        98. (New) The waveform processing method of claim 97, wherein the performing  
2 the factor analysis further comprises:  
3            forming a covariance array from the drift-compensated array;  
4            applying an eigenanalysis to the covariance array to define a complete set of  
5            eigenvectors and eigenvalues; and  
6            defining a set of drift-compensated principal factors by selecting a subset of  
7            eigenvectors from the complete set of eigenvectors.

1           99. (New) The waveform processing method of claim 98, wherein the defining  
2       the set of drift-compensated principal factors further comprises selecting the drift-  
3       compensated principal factors as a first few eigenvectors corresponding to eigenvalues above  
4       a certain limiting value.

1           100. (New) The waveform processing method of claim 89, wherein the performing  
2       the principal-factor determination comprises performing a linear-least-squares analysis.

1           101. (New) The waveform processing method of claim 100, wherein the  
2       performing a linear-least-squares analysis further comprises:  
3           selecting a set of initial factors from the set of drift-compensated row vectors of the  
4       drift-compensated array;

5           performing a linear-least-squares decomposition with the set of initial factors on the  
6       drift-compensated row vectors in the drift-compensated array to provide a set of residue  
7       factors; and

8           performing a Gram-Schmidt orthonormalization on the combined set of initial factors  
9       and residue factors to provide drift-compensated principal factors.

1           102. (New) The waveform processing method of claim 89, wherein the generating  
2       drift-compensated scaled target-factor profiles further comprises:

3           constructing a set of drift-compensated target factors on a space of the drift-  
4       compensated principal factors;

5           applying the set of drift-compensated target factors to a profile trajectory lying within  
6       a space of drift-compensated principal factors to obtain a sequential set of target-factor  
7       weighting factors corresponding to the drift-compensated target factors for the profile  
8       trajectory; and

9           outputting analytical results selected from the group consisting of a set of drift-  
10       compensated scaled target-factor profiles derived from the set of target-factor weighting  
11       factors, and the set of drift-compensated target factors.

1           103. (New) The waveform processing method of claim 102, wherein the  
2           constructing the set of drift-compensated target factors further comprises:  
3           generating a profile trajectory on a 3-dimensional projection of a 4-dimensional space  
4           of a set of first-four, drift-compensated principal factors along with a reference tetrahedron  
5           the vertices of which represent each of the first-four, drift-compensated principal factors;  
6           enclosing the profile trajectory within an enclosing tetrahedron with vertices centered  
7           on end-points and in proximity to turning points of the profile trajectory, and with faces lying  
8           essentially tangent to portions of the profile trajectory; and  
9           calculating the drift-compensated target factors from the normed coordinates of the  
10          vertices of the enclosing tetrahedron in terms of the drift-compensated principal factors.

1           104. (New) The waveform processing method of claim 103, wherein the  
2           generating the profile trajectory further comprises:  
3           calculating 4-space coordinates of a profile trajectory of drift-compensated target-  
4           factor profiles on a 4-dimensional space to produce four coordinates for each point in the  
5           profile trajectory, one coordinate for each of the first-four, drift-compensated principal  
6           factors;  
7           reducing the dimensionality of the coordinates of the profile trajectory by dividing  
8           each coordinate by a sum of all four 4-space coordinates to produce normed coordinates for  
9           the profile trajectory; and,  
10          plotting the normed coordinates for the profile trajectory in a 3-dimensional space the  
11          coordinate axes of which are edges of a reference tetrahedron, the vertices of which  
12          correspond to unit values for each of the first-four, drift-compensated principal factors in a  
13          manner analogous to plotting of coordinates on a quaternary phase diagram.

1        105. (New) An apparatus for compensating a plurality of sequential spectra and  
2 profiles derived therefrom for effects of drift comprising a spectroscopic analysis system,  
3 wherein the spectroscopic analysis system comprises:

4            a spectrometer; and

5            a computer system, coupled to the spectrometer, for analyzing spectra input from the  
6 spectrometer, the computer system further comprising a spectral processor for compensating  
7 a plurality of sequential spectra and profiles derived therefrom for effects of drift of data  
8 along an independent variable axis.

1        106. (New) The apparatus of claim 105, wherein the spectrometer comprises an  
2 electron spectrometer.

1        107. (New) The apparatus of claim 106, wherein the electron spectrometer  
2 comprises an Auger spectrometer.

1        108. (New) The apparatus of claim 106, wherein the electron spectrometer  
2 comprises an x-ray photoelectron spectrometer.

1        109. (New) The apparatus of claim 106, wherein the electron spectrometer  
2 comprises an electron energy loss spectrometer.

1 110. (New) The apparatus of claim 105, wherein the spectral processor further  
2 comprises:

3 a spectral transformer operating on a plurality of sequential spectra obtained from the  
4 spectrometer to provide an array of row vectors compensated for effects of drift of data along  
5 the independent variable axis, wherein the array of row vectors compensated for effects of  
6 drift of data along an independent variable axis constitutes a drift-compensated array;

7 a principal-factor determinator operating on the drift-compensated array to provide a  
8 set of principal factors compensated for effects of drift of data along the independent variable  
9 axis; and

10 a profile generator operating on a profile trajectory of the row vectors compensated  
11 for effects of drift of data along the independent variable axis lying within a space of  
12 principal factors compensated for effects of drift of data along the independent variable axis  
13 to provide a set of scaled target-factor profiles compensated for effects of drift of data along  
14 the independent variable axis.

1 111. (New) The apparatus of claim 110, wherein the independent variable axis  
2 comprises an abscissa of the electron spectrum.

1 112. (New) The apparatus of claim 111, wherein the drift comprises drift of data  
2 along the independent variable axis in a positive or negative direction.

1 113. (New) The apparatus of claim 110, wherein the spectral transformer outputs  
2 to an output device the drift-compensated row vectors of the drift-compensated array as a  
3 sequential series of moduli of Fourier-transformed spectra.

1 114. (New) The apparatus of claim 110, wherein the profile generator operating on  
2 the set drift-compensated scaled target-factor profiles generates a set of drift-compensated  
3 compositional profiles.

1 115. (New) The apparatus of claim 110, wherein the spectral transformer accepts  
2 as input the plurality of sequential spectra obtained from the spectrometer into the computer  
3 system, orders the spectra in a primal array, wherein each sequential spectrum constitutes a  
4 successive row vector of the primal array, and removes phase factors due to drift using a  
5 dephasor that transforms the primal array into a drift-compensated array.

1 116. (New) The apparatus of claim 115, wherein the dephasor that transforms the  
2 primal array into the drift-compensated array applies a Fourier transform to the spectra in the  
3 primal array of row vectors to form an array of Fourier-transformed row vectors, multiplies  
4 each Fourier-transformed row vector by a complex conjugate of each Fourier-transformed  
5 row vector to form a squared moduli vector thereby removing phase factors due to drift, takes  
6 the square root of each element of the squared moduli vector to create a corresponding  
7 moduli vector, and forms a drift-compensated array of moduli vectors by successively  
8 sequencing the moduli vectors as successive drift-compensated row vectors in a drift-  
9 compensated array, wherein the moduli vectors constitute moduli of Fourier-transformed  
10 spectra.

1 117. (New) The apparatus of claim 116, wherein the dephasor that transforms the  
2 primal array into the drift-compensated array fits each spectrum in the primal array using  
3 selected reference spectra, calculates a corresponding reference weighting factor for each  
4 reference spectrum corresponding to each spectrum in the primal array, synthesizes a  
5 corresponding drift-compensated spectrum given by the sum of each selected reference  
6 spectrum multiplied by the corresponding reference weighting factor thereby removing phase  
7 factors due to drift, and forms a drift-compensated array by successively sequencing the drift-  
8 compensated spectra as successive drift-compensated row vectors in the drift-compensated  
9 array.

1        118. (New) The apparatus of claim 117, wherein the spectral transformer outputs  
2 to an output device analytical results selected from the group consisting of the selected  
3 reference spectra used in the fitting procedure, the drift-compensated row vectors of the drift-  
4 compensated array as a sequential series of drift-compensated spectra, reference weighting  
5 factors for each reference spectrum corresponding to each spectrum in the primal array as a  
6 set of drift-compensated reference-spectrum profiles, and phase factors due to drift for each  
7 reference spectrum corresponding to each spectrum in the primal array as a set of phase-  
8 factor profiles.

1        119. (New) The apparatus of claim 110, wherein the principal-factor determinator  
2 comprises a factor analyzer.

1        120. (New) The apparatus of claim 119, wherein the factor analyzer forms a  
2 covariance array from the drift-compensated array, applies an eigenanalysis to the covariance  
3 array to define a complete set of eigenvectors and eigenvalues, and defines a set of drift-  
4 compensated principal factors as a subset of eigenvectors determined by a selector operating  
5 on the complete set of eigenvectors.

1        121. (New) The apparatus of claim 120, wherein the selector operates on the  
2 complete set of eigenvectors to define the set of drift-compensated principal factors as a first  
3 few eigenvectors corresponding to eigenvalues above a certain limiting value.

1        122. (New) The apparatus of claim 110, wherein the principal-factor determinator  
2 comprises a linear-least-squares analyzer.

1        123. (New) The apparatus of claim 122, wherein the linear-least-squares analyzer  
2 selects a set of initial factors from the set of drift-compensated row vectors of the drift-  
3 compensated array, performs a linear-least-squares decomposition with the set of initial  
4 factors on the drift-compensated row vectors in the drift-compensated array to provide a set  
5 of residue factors, and performs a Gram-Schmidt orthonormalization on the combined set of  
6 initial factors and residue factors to provide drift-compensated principal factors.

1           124. (New) The apparatus of claim 110, wherein the profile generator defines a set  
2 of drift-compensated target factors on a space of the drift-compensated principal factors  
3 determined by a target-factor constructor operating on the drift-compensated principal  
4 factors, applies the set of drift-compensated target factors to a profile trajectory lying within  
5 a space of drift-compensated principal factors to obtain a sequential set of target-factor  
6 weighting factors corresponding to the drift-compensated target factors for the profile  
7 trajectory, and outputs to an output device analytical results selected from the group  
8 consisting of a set of drift-compensated scaled target-factor profiles derived from the set of  
9 target-factor weighting factors, and the set of drift-compensated target factors.

1           125. (New) The apparatus of claim 124, wherein the target-factor constructor  
2 generates a profile trajectory on a 3-dimensional projection of a 4-dimensional space of a set  
3 of first-four, drift-compensated principal factors along with a reference tetrahedron the  
4 vertices of which represent each of the first-four, drift-compensated principal factors;  
5 encloses the profile trajectory within an enclosing tetrahedron with vertices centered on end-  
6 points and in proximity to turning points of the profile trajectory, and with faces lying  
7 essentially tangent to portions of the profile trajectory; and calculates the drift-compensated  
8 target factors from the normed coordinates of the vertices of the enclosing tetrahedron in  
9 terms of the drift-compensated principal factors.

1           126. (New) The apparatus of claim 125, wherein the target-factor constructor in  
2 generating the profile trajectory further calculates 4-space coordinates of a profile trajectory  
3 of drift-compensated target-factor profiles on a 4-dimensional space to produce four  
4 coordinates for each point in the profile trajectory, one coordinate for each of the first-four,  
5 drift-compensated principal factors; reduces the dimensionality of the coordinates of the  
6 profile trajectory by dividing each coordinate by a sum of all four 4-space coordinates to  
7 produce normed coordinates for the profile trajectory; and, plots the normed coordinates for  
8 the profile trajectory in a 3-dimensional space the coordinate axes of which are edges of a  
9 reference tetrahedron the vertices of which correspond to unit values for each of the first-  
10 four, drift-compensated principal factors in a manner analogous to plotting of coordinates on  
11 a quaternary phase diagram.

1       127. (New) The apparatus of claim 124, wherein the profile generator further  
2 defines a set of drift-compensated scaled target-factor profile values as the set of scaled  
3 target-factor weighting factors, divides each drift-compensated scaled target-factor profile  
4 value by a profile sensitivity factor for each constituent corresponding to the target factor to  
5 provide a sensitivity-scaled target-factor profile value, divides each sensitivity-scaled target-  
6 factor profile value for a given cycle number by the sum of all the sensitivity-scaled target-  
7 factor profile values for the given cycle number to provide drift-compensated compositional  
8 profile values at the given cycle number, and outputs the drift-compensated compositional  
9 profile values as a set of drift-compensated compositional profiles.

1       128. (New) An apparatus for compensating a plurality of sequential waveforms  
2 and profiles derived therefrom for effects of drift, comprising a waveform analysis system,  
3 wherein the waveform analysis system comprises:

4           a waveform-source device; and  
5           a computer system, coupled to the waveform-source device, for analyzing waveforms  
6 input from the waveform-source device, the computer system further comprising a waveform  
7 processor for compensating a plurality of sequential waveforms and profiles derived  
8 therefrom for effects of drift of data along an independent variable axis.

1       129. (New) The apparatus of claim 128, wherein the waveform processor further  
2 comprises:

3           a waveform transformer operating on a plurality of sequential waveforms obtained  
4 from a waveform-source device to provide an array of row vectors compensated for effects of  
5 drift of data along the independent variable axis, wherein the array of row vectors  
6 compensated for effects of drift of data along the independent variable axis constitutes a  
7 drift-compensated array;

8           a principal-factor determinator operating on the drift-compensated array to provide a  
9 set of principal factors compensated for effects of drift of data along the independent variable  
10 axis; and

11           a profile generator operating on a profile trajectory of the row vectors compensated  
12 for effects of drift of data along the independent variable axis lying within a space of  
13 principal factors compensated for effects of drift of data along the independent variable axis  
14 to provide a set of scaled target-factor profiles compensated for effects of drift of data along  
15 the independent variable axis.

1       130. (New) The apparatus of claim 129, wherein the independent variable axis  
2 comprises a time-axis of a waveform.

1       131. (New) The apparatus of claim 130, wherein the drift comprises a phase lag or  
2 lead of data representing a waveform.

1       132. (New) The apparatus of claim 129, wherein the waveform transformer  
2 outputs the drift-compensated row vectors of the drift-compensated array as a sequential  
3 series of moduli of Fourier-transformed waveforms.

1       133. (New) The apparatus of claim 129, wherein the waveform transformer  
2 accepts as input the plurality of sequential waveforms obtained from a waveform-source  
3 device into the computer system, orders the waveforms in a primal array, wherein each  
4 sequential waveform constitutes a successive row vector of the primal array, and removes  
5 phase factors due to drift using a dephasor that transforms the primal array into a drift-

6 compensated array.

1 134. (New) The apparatus of claim 133, wherein the dephasor that transforms the  
2 primal array into the drift-compensated array applies a Fourier transform to the primal array  
3 of row vectors to form an array of Fourier-transformed row vectors, multiplies each Fourier-  
4 transformed row vector by a complex conjugate of each Fourier-transformed row vector to  
5 form a squared moduli vector thereby removing phase factors due to drift, takes the square  
6 root of each element of the squared moduli vector to create a corresponding moduli vector,  
7 and forms a drift-compensated array of moduli vectors by successively sequencing the  
8 moduli vectors as successive drift-compensated row vectors in a drift-compensated array,  
9 wherein the moduli vectors constitute moduli of Fourier-transformed waveforms.

1 135. (New) The apparatus of claim 133, wherein the dephasor that transforms the  
2 primal array into the drift-compensated array fits each waveform in the primal array using  
3 selected reference waveforms, calculates a corresponding reference weighting factor for each  
4 reference waveform corresponding to each waveform in the primal array, synthesizes a  
5 corresponding drift-compensated waveform given by the sum of each selected reference  
6 waveform multiplied by the corresponding reference weighting factor thereby removing  
7 phase factors due to drift, and forms a drift-compensated array by successively sequencing  
8 the drift-compensated waveforms as successive drift-compensated row vectors in the drift-  
9 compensated array.

1 136. (New) The apparatus of claim 135, wherein the waveform transformer  
2 outputs to an output device analytical results selected from the group consisting of the  
3 selected reference waveforms used in the fitting procedure, the drift-compensated row  
4 vectors of the drift-compensated array as a sequential series of drift-compensated waveforms,  
5 reference weighting factors for each reference waveform corresponding to each waveform in  
6 the primal array as a set of drift-compensated reference-waveform profiles, and phase factors  
7 due to drift for each reference waveform corresponding to each waveform in the primal array  
8 as a set of phase-factor profiles.

1           137. (New) The apparatus of claim 129, wherein the principal-factor determinator  
2   comprises a factor analyzer.

1           138. (New) The apparatus of claim 137, wherein the factor analyzer forms a  
2   covariance array from the drift-compensated array, applies an eigenanalysis to the covariance  
3   array to define a complete set of eigenvectors and eigenvalues, and defines a set of drift-  
4   compensated principal factors as a subset of eigenvectors determined by a selector operating  
5   on the complete set of eigenvectors.

1           139. (New) The apparatus of claim 138, wherein the selector operates on the  
2   complete set of eigenvectors to define the set of drift-compensated principal factors as a first  
3   few eigenvectors corresponding to eigenvalues above a certain limiting value.

1           140. (New) The apparatus of claim 129, wherein the principal-factor determinator  
2   comprises a linear-least-squares analyzer.

1           141. (New) The apparatus of claim 140, wherein the linear-least-squares analyzer  
2   selects a set of initial factors from the set of drift-compensated row vectors of the drift-  
3   compensated array, performs a linear-least-squares decomposition with the set of initial  
4   factors on the drift-compensated row vectors in the drift-compensated array to provide a set  
5   of residue factors, and performs a Gram-Schmidt orthonormalization on the combined set of  
6   initial factors and residue factors to provide drift-compensated principal factors.

1           142. (New) The apparatus of claim 129, wherein the profile generator defines a set  
2   of drift-compensated target factors on a space of the drift-compensated principal factors  
3   determined by a target-factor constructor operating on the drift-compensated principal  
4   factors, applies the set of drift-compensated target factors to a profile trajectory lying within  
5   a space of drift-compensated principal factors to obtain a sequential set of target-factor  
6   weighting factors corresponding to the drift-compensated target factors for the profile  
7   trajectory, and outputs to an output device analytical results selected from the group  
8   consisting of a set of drift-compensated scaled target-factor profiles derived from the set of

- 9 target-factor weighting factors, and the set of drift-compensated target factors.

1        143. (New) The apparatus of claim 142, wherein the target-factor constructor  
2 generates a profile trajectory on a 3-dimensional projection of a 4-dimensional space of a set of  
3 first-four, drift-compensated principal factors along with a reference tetrahedron the vertices of  
4 which represent each of the first-four, drift-compensated principal factors; encloses the profile  
5 trajectory within an enclosing tetrahedron with vertices centered on end-points and in proximity  
6 to turning points of the profile trajectory, and with faces lying essentially tangent to portions of  
7 the profile trajectory; and calculates the drift-compensated target factors from the normed  
8 coordinates of the vertices of the enclosing tetrahedron in terms of the drift-compensated  
9 principal factors.

1        144. (New) The apparatus of claim 143, wherein the target-factor constructor in  
2 generating the profile trajectory further calculates 4-space coordinates of a profile trajectory of  
3 drift-compensated target-factor profiles on a 4-dimensional space to produce four coordinates for  
4 each point in the profile trajectory, one coordinate for each of the first-four, drift-compensated  
5 principal factors; reduces the dimensionality of the coordinates of the profile trajectory by  
6 dividing each coordinate by a sum of all four 4-space coordinates to produce normed coordinates  
7 for the profile trajectory; and, plots the normed coordinates for the profile trajectory in a 3-  
8 dimensional space the coordinate axes of which are edges of a reference tetrahedron the vertices  
9 of which correspond to unit values for each of the first-four, drift-compensated principal factors  
10 in a manner analogous to plotting of coordinates on a quaternary phase diagram.

1        145. (New) An article of manufacture comprising a program storage medium readable  
2 by a computer, the medium tangibly embodying one or more programs of instructions executable  
3 by the computer to perform a method for compensating a plurality of sequential spectra and  
4 profiles derived therefrom for effects of drift, the method comprising:

5                transforming a plurality of sequential spectra obtained from a spectrometer to provide an  
6 array of row vectors compensated for effects of drift of data along an independent variable axis,  
7 wherein the array of row vectors compensated for effects of drift of data along the independent  
8 variable axis constitutes a drift-compensated array;

9                performing a principal-factor determination on the drift-compensated array to provide a  
10 set of principal factors compensated for effects of drift of data along the independent variable  
11 axis; and,

12                generating, from a profile trajectory of the row vectors compensated for effects of drift of  
13 data along the independent variable axis lying within a space of principal factors compensated  
14 for effects of drift of data along the independent variable axis, scaled target-factor profiles  
15 compensated for effects of drift of data along the independent variable axis.

1        146. (New) The article of manufacture of claim 145 further comprising generating  
2 drift-compensated compositional profiles from the set of drift-compensated scaled target-factor  
3 profiles.

1        147. (New) An article of manufacture comprising a program storage medium readable  
2 by a computer, the medium tangibly embodying one or more programs of instructions executable  
3 by the computer to perform a method for compensating a plurality of sequential waveforms and  
4 profiles derived therefrom for effects of drift of data along the independent variable axis, the  
5 method comprising:

6                transforming a plurality of sequential waveforms obtained from a waveform-source  
7 device to provide an array of row vectors compensated for effects of drift of data along an  
8 independent variable axis, wherein the array of row vectors compensated for effects of drift of  
9 data along the independent variable axis constitutes a drift-compensated array;

10                performing a principal-factor determination on the drift-compensated array to provide a  
11 set of principal factors compensated for effects of drift of data along the independent variable  
12 axis; and,

13                generating, from a profile trajectory of the row vectors compensated for effects of drift of  
14 data along the independent variable axis lying within a space of principal factors compensated  
15 for effects of drift of data along the independent variable axis, scaled target-factor profiles  
16 compensated for effects of drift of data along the independent variable axis.